

REMARKS

This Amendment is accompanied by a Request for Continued Examination and the associated fee. Accordingly, entry and full consideration of this Amendment are respectfully requested.

Entry of this Amendment and allowance of all of the pending claims are respectfully requested. Applicant has amended claims 1 and 9. No other amendments have been made. Claims 1-16 remain pending in the application.

The Examiner has rejected claims 1-2, 5, 7, 9-10 and 13-14 under 35 USC 103(a) as being obvious in view of the combination of Colomes et al. and Beerends (“Measuring the Quality of Speech and Music Codecs, an Integrated Psychoacoustic Approach”).

Claims 3 and 11 stand rejected on the same grounds, further in view of Hunt (U.S. Patent No. 5,809,453); claims 4, 6, 12 and 15 stand rejected on the same grounds, further in view of Hollier (U.S. Patent No. 5,621,854); and claims 8 and 16 stand rejected on the same grounds, further in view of ITU-R BS 1387. These rejections, to the extent that they may be deemed applicable to the claims as now presented, are respectfully, but most strenuously traversed.

Applicant has amended claim 1 for clarity, and has amended claim 9 to introduce language consistent with the language of claim 1. For the following reasons, these claims are believed allowable.

The Examiner stated that Colomes teaches the matter of claim 1 with the exception of the perceptual difference in audio quality. For this teaching the Examiner relies upon Beerends.

Applicant notes that although Beerends does refer to a cognitive process, it bases its objective perceptual assessment on a single cognitive model component. Figure 2 illustrates that a “difference in the internal representation determines the audible difference” is the sole factor that Beerends makes use of in the computation of the objective perceptual assessment. Applicant further notes that claim 9, as amended, states that the “perceptual quality rating [is] determined based on the plurality of cognitive model components.”

At this time, Applicant would like to take the opportunity to re-iterate arguments presented previously with respect to the Colomes reference and will then address the addition of the Beerends reference to address the obviousness rejection.

As previously discussed, the Colomes reference is not directed to the provision of an objective perceptual quality rating. Instead, the Colomes reference teaches what can best be described as an element analogous to the peripheral ear processor recited in claim

9. The Examiner has mis-characterized the Colomes reference as teaching the derivation of a plurality of cognitive model components including excitation curves, excitation values, and spectral bandwidth. Applicant notes that Colomes teaches the use of these physically measurable quantities as elements in the determination of the physical response of a listener's ear. Thus, as described in previous responses and during the previous interviews, these measures are used in the computation of a value equivalent to the basilar sensation signal in the inner ear processor recited in claim 9. Colomes cannot be interpreted as teaching the use of these values in a cognitive processor, as Colomes does not truly teach cognitive processing.

Beerends, however, does teach cognitive processing. Beerends is directed to attempting the derivation of a perceptual quality measure for both speech and audio codecs. Beerends teaches (on page 6 in the last paragraph) that signals are "decomposed by our cognitive auditory scene analyser into two parts. One part is the input signal, the other part is the distortion..." Beerends then notes that there is an asymmetry in the manner in which humans perceive distortions. If a minor component of a signal is removed it is viewed as difficult to perceive, whereas the addition of an equivalently minor component is quickly recognized. This drives Beerends to characterize the difference between the signals on the basis of a "... power ratio between the output y and input x , p_y/p_x at a certain time frequency point..." When this ratio has a value greater than 1.0 Beerends determines that the distortion is more annoying than when the ratio is less than 1.0. This observation, and the use of power ratios is the basis of how Beerends computes noise disturbance values.

Human hearing can be divided into two stages. First, there is a physical process whereby the ear receives an audio signal and generates sensations. Following this, there is a perceptual process that occurs.

Colomes is directed to the first of these two processes. This physical process can be modeled, and is present in the system of claim 9 in the inner ear processor. Because this is a physical process, a model can be used to obtain the basilar sensation signal.

Beerends is directed to the second of these two processes. However, Beerends teaches a single input cognitive processor (as clearly indicated in Figure 2). Beerends does not make use of a multiple input system due to a failure in the prior art to recognize that human perception of audio quality cannot be simplified to a single mathematical representation. Applicant has addressed the inability to model human perception of audio differences using a single mathematical representation through the use of a cognitive processor that determines the perceptual quality rating using a plurality of cognitive model components.

Applicant notes that claim 9 recites that “the perceptual quality rating determined based on the plurality of cognitive model components”, which is neither taught, nor taught towards in Beerends which is limited to a single input process. Whereas Colomes uses a plurality of inputs, these are used in the determination of the basilar sensation signal, and not in the determination of the perceptual quality rating. Applicant submits that the prior art does not teach the use of a plurality of cognitive model inputs in the determination of the perceptual quality rating. Instead, the prior art attempts to create a mathematical model of how a listener cognitively perceives a signal based on a single input. Mathematical modeling of the cognitive process in the prior art has been based on a single input model due to the complexity of modeling a cognitive process in accordance with a plurality of inputs. The system of claim 9 recites a use of a plurality of cognitive inputs, as it was recognized by the Applicants that a single input cannot be used to determine how differences in a signal will be perceived. Due to the reliance of the prior art on attempts to rigidly model the perception of differences in audio perception, the use of multiple inputs in the prior art cannot be accomplished. Any attempt at modifying the prior art models of cognitive perception to include multiple inputs would necessitate a complex redesign of the cognitive modeling performed. One skilled in the art will appreciate that the manner in which human perception of signal differences is performed changes in dependence upon the frequency at which the difference occurs, whether the difference involves a change in the volume of a component of the signal or not, whether the difference constitutes the addition or the subtraction of a component to the signal and a host of other factors. The effect that any one factor has on perception changes when it is combined with other factors. This results in an overly complex model. Thus, the change from a single input system, to a multiple input system is not a simple step that can be characterized as a workshop improvement, and instead should be recognized as an inventive step. Accordingly, the prior art fails to teach, or teach toward, the use of multiple cognitive model components in the determination of the perceptual quality rating. Accordingly, Applicant submits that claim 9, as amended, is novel and non-obvious in view of the cited references, and respectfully requests that the rejection of claim 9 under 35 USC 103(a) be withdrawn.

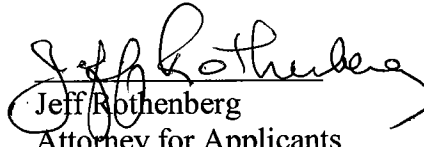
Applicant notes, that the Examiner applied the same rationale to the rejection of claim 1 as was applied to claim 9. Applicant has amended claim 1 for clarity, and reiterates the argument presented above with respect to claim 9 and applies it to claim 1. Accordingly, Applicant requests the rejection of claim 1 under 35 USC 103(a), as being obvious in view of the combination of Colomes and Beerends, be withdrawn.

As all remaining claims depend from either claim 1 or claim 9, directly or indirectly, and as none of the cited references, alone or in combination, teach the matter of claims 1 and 9, Applicant re-iterates the argument presented above, and respectfully requests that the rejection of claims 2-8 and 10-16 under 35 USC 103(a) be withdrawn.

For all of the above reasons, Applicant requests that this Amendment be entered and all of the pending claims allowed.

If it would advance the prosecution of this application, the Examiner is requested to contact Applicant's attorney at the below indicated telephone number.

Respectfully submitted,


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